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PLANT RECORDS OF THE ROCKS.

Studies in Fossil Botany. By Dr. Dukinfield H. Scott, F.R.S. Second edition. Vol. I., Pteridophyta. Pp. xx+363. Price 6*s*. net. Vol. II., Spermophyta. Pp. xiii+(355–676). Price 5*s*. net. (London: A. and C. Black, vol. i., 1908; vol. ii., 1909.) Price, 2 vols., 10*s*. 6*d*. net.

IN the preface to the first edition the author expressed the hope that the palæontological record "will no longer be ignored by students of the evolution of plants." Since these words were written the study of the plant-records of the rocks has made steady progress, not only as regards results, but in the vigorous growth of interest shown in the relics of past floras. This remarkable activity is in large measure the direct result of the influence exerted by Dr. Scott, not only by his own researches and by the encouragement and generous assistance which he is always ready to give to younger workers, but in no small degree by his well-balanced and lucid treatment of that branch of botany to which he has devoted himself with conspicuous success.

The recent issue of the "Studies" is a new edition in more than name; two volumes replace the single volume in which the lectures were originally published, and, as the result of the rapid progress of palæobotanical work during the last eight years, many of the chapters have been largely re-written and others have been amplified. In the section devoted to the Equisetales the additions are few; reference is made to Mr. Hickling's recent account of the course of the vascular bundles in the sporangiophores of *Palaeostachya vera,* and to Halle's monograph of Mesozoic species of Equisetites. In the first edition a brief reference was made to the important discovery of Lepidocarpon, a seed-bearing lycopodiaceous strobilus: subsequent work by Dr. Scott and others has now rendered possible a more adequate treatment of this and similar types. A drawing of a transverse section of *Lepidodendron Wunschianum,* published in the first edition, is again reproduced with a broad band of tissue labelled "phloem," though it consists of extremely short parenchymatous cells and a few immature xylem elements. It is a fact of considerable interest that in Lepidodendron stems which have formed a broad cylinder of secondary xylem, no true secondary phloem has been discovered. To the consideration of this question Dr. Scott hardly does justice. There are still many points to be cleared up in regard to the morphology of Palæozoic lycopods, and this can be done only by a detailed comparative treatment of all known species, founded on anatomical characters.

It is, however, especially in the account of the ferns that the results of recent investigations are most apparent. The student of Palæozoic ferns has now to face the difficulty of distinguishing between true members of the Filicineæ and fern-like plants which bore seeds. The account of the Botryopterideæ, a group of ferns which has gained considerably in importance since the removal of many genera of Palæozoic "ferns" to the new group Pteridospermeæ, is particularly welcome as coming from one who is exceptionally well qualified to deal with these still imperfectly known types. The excellent description, which is necessarily condensed, leads one to express the hope that Dr. Scott will soon publish a more comprehensive account of his researches into the structure and affinities of these generalised ferns. The account of the genus Lyginodendron has been modified as the result of Dr. Kidston's important contribution to our knowledge of the male reproductive organs, which had been previously referred to Zeiller's genus Crossotheca and regarded as fern sporangia. The chapter on the Medulloseæ contains interesting new matter, including some admirable drawings by Mr. Maslen of the seed Trigonocarpon and photomicrographs illustrating Prof. Oliver's recent work on the multicellular pollen-grains, and what are believed to be the remains of motile male gametes of Stephanospermum.

A word of praise is due to the publishers for the quality of the type and for the successful reproduction of the illustrations. Some new figures have been added, the most striking of which is, perhaps, a drawing of a transverse section of a young vascular bundle of *Botryopteris hirsuta,* showing the thin-walled immature xylem, with a few lignified protoxylem elements. It is no exaggeration to say that the volumes before us afford the most convincing demonstration so far presented in book-form of the possibilities of palæobotanical research. As we read the descriptions of many of the extinct types and note the perfection of the preservation of their tissues, we forget that the material from which the data have been obtained has for countless ages been entombed in the older rocks of the earth's crust.

Though mainly concerned with Palæozoic plants, Dr. Scott adds a chapter on Mesozoic gymnosperms, in which special attention is directed to Mr. Wieland's able monograph of the remarkable silicified cycadean stems from America. In the clearly written account of these plants, emphasis is laid on the striking differences between their flowers and those of recent cycads, a difference which is necessarily somewhat obscured by the application of the term cycad to plants the reproductive organs of which differ *toto coelo* from those of the Cycadaceæ. The opinion held by several botanists that the results of Mr. Wieland's work afford a clue to the solution of the problem of the origin of the angiosperms receives due attention. Bearing in mind the scope of the "Studies," it would be unreasonable to find fault with the brevity of the section devoted to the past history of the Coniferales. In the admirable chapter devoted to general results, the author adopts a new grouping of the vascular plants, which he naturally speaks of as provisional. As knowledge increases, we conveniently record progress towards what we believe to be a closer approximation to a natural scheme of classification by means of changes in the arrangement of the subdivisions or by a redistribution of genera. Any change challenges criticism, but, whether accepted or not, it stimulates discussion and helps us to correlate our

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ideas. Bacon's aphorism, "Truth more easily comes out of error than out of confusion," may be applied to any honest attempt to express progress in knowledge by a re-adjustment of existing classifications. These words may seem to imply a disinclination to accept the views embodied in Dr. Scott's classification; they are quoted rather as an expression of gratitude for a contribution the value of which is to be measured, not by considerations of finality, but by the stimulus which it gives to wholesome criticism and to a broader survey of the facts at our disposal.

By the expansion of the "Studies," Dr. Scott has given a further incentive to students of plant evolution, and has produced a book which, in clearness of exposition, in scientific accuracy, and in soundness of judgment, it would be difficult to surpass.

A. C. SEWARD.

PISCINE MORPHOLOGY.

A Treatise on Zoology. Edited by Sir Ray Lankester, K.C.B., F.R.S. Part IX., Vertebrata Craniata. First Fascicle, Cyclostomes and Fishes. By E. S. Goodrich, F.R.S. Pp. xvi+518. (London: A. and C. Black, 1909.) Price 20*s.* net.

BOTH the author of this book and the editor of the "Treatise on Zoology" are to be congratulated on this, the latest addition to the series. The author is dealing with a subject with which he is thoroughly familiar, and to which he has contributed a large amount of important research. The whole plan of the book is carefully conceived and carried out, and we can only regret that the necessity to keep the size of the book within certain limits has made great concentration inevitable in dealing with many parts of the subject. However, references to more than five hundred original papers afford a guide to the student who wishes to amplify Mr. Goodrich's text.

This book is less a mere compilation than are most text-books, and the personality of the author is constantly felt. One of the chief features is the great number of excellent new figures, largely semi-diagrammatic representations of dissections, showing the three dimensions of space. Readers will be deeply grateful for this, for we have all experienced the annoyance of turning up text-book after text-book in the attempt to clear up some doubtful point, and finding the same figure, taken from some time-honoured authority, reproduced in all. How little the book before us suffers from this common failing is evident when it is said that more than a hundred and fifty of the figures are of the author's own drawing.

The subject is considered from a purely morphological and evolutionary point of view, to the almost complete exclusion of the physiological side, and the references to function are extremely few. While it is necessary in a book of limited length to discriminate between what to put in and what to leave out, one feels, perhaps, that in this case the fact that organs are functional parts of living animals has been kept too much in the background.

It is natural, and also desirable, that an author should treat at most length those parts of his subject to which he himself has given most attention, even at the expense of other portions. Here, many of the "soft-parts," for example, the nervous system, and the digestive organs receive rather scant attention. On the other hand, the supporting tissues, especially the exoskeleton and the skeleton of the median and paired fins, are admirably treated, and at considerable length.

The classification adopted differs in many respects from that found in contemporary text-books. The Pisces are divided into three great groups, the Chondricthyes, Ostracodermi, and Osteichthyes. The Chondricthyes include the Elasmobranchii (Selachii and Holocephali) and the extinct groups usually associated with them. The Osteichthyes are divided into two groups, the first including the Dipnoi and Coccosteomorphi, the second the Teleostomi. Useful phylogenetic trees are given at the beginning of the larger groups. In dealing with the Teleostei, use is freely made of subdivisions represented only by letters or numerals, thus saving the coining of new words—a most desirable proceeding in dealing with a provisional classification, such as that of the Teleosteans must at present be.

A few special points of minor importance call for criticism. On p. 11 we read that

> "Stöhr showed that, in the Urodela, the 'vertebral region' is developed from three distinct centres—the parachordal, the mesotic cartilage of the auditory capsule, and an occipital segment resembling a vertebra."

This is a very confusing use of the terms, neither in accordance with Stöhr's original usage nor with that commonly accepted at present. Stöhr divided the post-trabecular elements of the skull into three, the "Balkenplatte," mesotic cartilage, and occipital portion, and identified the *last* of these with Huxley's parachordals. The custom now is to use the word parachordal as including all these three sections. The student will have difficulty in reconciling Mr. Goodrich's use of the term with either of the other two meanings.

On p. 116 we read, as one of the *primitive* characters of the Pisces (which group here does not include the Cyclostomes), that the pericardium may communicate with the abdominal cœlome. In view of the fact that this communication in Elasmobranchs is formed secondarily in ontogeny after the two cavities have been completely separated from each other, it would have been better not to have included it in the list of characters "considered primitive" without a qualifying note.

"Occipital" (p. 239) hardly seems a happy name for the large dermal bone of the Dipnoi (Wiedersheim's fronto-parietal), which, indeed, roofs in the whole cranium in the Dipneumona.

Considering the book as a whole, we may say confidently that, in spite of the number of excellent text-books already available, Mr. Goodrich's work will be extremely welcome to the student of vertebrate morphology, as being both a trustworthy source of general information on the subject and in many points an epitome of recent research by one who has himself taken a most important part in it.

W. E. A.

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